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AUTHOR Matthews, Bruce E.; And Others
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ABSTRACT

Designed as a resource base upon which elementary school educators can build outdoor learning experiences, this resource packet contains a basic, multidisciplinary snowshoeing lesson plan, pre- and post-trip suggestions, and suggestions for further winter outdoor study on snowshoes. Specifically, there are narratives and illustrations addressed at the following: introduction (brief); the history of snowshoes (1 page); pre-trip suggestions including activities in social studies, language arts, art, science, and math; the snowshoe lesson itself (orientation and history; snowshce construction; snowshoe types and uses; care of snowshoes; how to put on snowshoes, going outside; actually using snowshoes; and snowshoe activities--running, walking, hikes, etc.); post-trip followup activities in social studies, language arts, art, science, math, and physical education; discussion of how body heat is lost; discussion on how to dress; discussion of the types and uses of snowshoes and snowshoe care and maintenance; discussion on how to make snowshoes; additional snowshoe activities; how to preserve snowshoe tracks; how to make paper snowflakes; how to make permanent replicas of snowflakes and other frozen crystal structures; how to construct snow buildings; discussion of winter birds; and special tips for the teacher. (JC)

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WINTER OUTDOOR EDUCATION ACTIVITIES: Snowshoes and Exploring the Winter Environment

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PREPARED BY:
CORTLAND/MADISON BOCES
OUTDOOR-ENVIRONMENTAL EDUCATION PROGRAM
Bruce E. Matthews - Coordinator
David B. Oakes - Intern
George Chue
Marilyn Murphy

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INTRODUCTION

SNOWSHOES!! A shiver of anticipation runs through the class, and once again the teachable moment occurs. The kind of excitement generated by thoughts of snowshoeing in the winter wonderland can rarely be duplicated in the classroom environment. It now becomes the task of teachers as Outdoor Educators to channel this excitement into a series of dynamic learning experiences, capitalizing on the excitement of the snowshoe lesson itself.

The purpose of this packet is to provide a resource base, upon which educators can build such outdoor learning experiences. It contains a basic snowshoeing lesson plan which includes an introduction outline to snowshoes. Pre-trip and post-trip followup suggestions are always a part of any multidisciplinary outdoor experience, and are also included in this packet. In addition, many suggestions are made for further winter outdoor study on snowshoes. It is hoped that the information contained herein will function as a springboard for further winter outdoor learning.

Winter can be a dynamic time of the year for Outdoor Education, as can any season. Since we in New York State are blessed with a great deal of winter, why not use it to its best educational advantage? The utilization of the winter outdoors as an exciting learning environment can immeasurably enhance the educational process and snowshoes can make it that much better!!

HISTORY OF SNOWSHOES

The first snowshoes are believed to have originated in Central Asia, about 4000 B.C. This "tool of mobility" is thus one of the oldest inventions of man.

The snowshoe/ski was utilized by these aboriginal peoples in their northward migrations. The mountainous terrain of this area was better suited to the long narrow type. This contribution to technology enabled the aboriginal peoples to migrate from Asia into what are now know as Siberia, Scandinavia and the Americas.

It is believed that Asia and the Americas were once joined by land at the location where the Bering Strait now separates the United States from the Soviet Union. During this time the various predecessors of the Eskimo and the American Indian moved into the Americas.

Eskimos, for the most part, did not rely heavily upon the snowshoe as a means of transportation. Eskimos living in the tundra traveled mostly over sea ice or on the wind-packed snow of the tundra. Indians, on the other hand, were the great innovators in snowshoe design. The lived in the forested temperate zone where snowshoes were a necessity for travel in wintertime.

Indians that lived in regions where snow covered the ground in wintertime used snowshoes extensively for trading and trapping during the cold winter months. The Plains Indians, for instance, used snowshoes to hunt buffalo. Winter is the ideal time for trapping and hunting since this is the season when the furs are thickest, and the snow shows up the animal tracks extremely well.

The French are probably the first white men to extensively use the snowshoe. The French began to move in and colonize the St. Lawrence River area in the 1600's. They tended to interact freely with the Indians and they quickly learned how to utilize the snowshoe for easier travel and trapping.

During the French and Indian wars, snowshoes were used by the French and their Indian allies to raid the English settlements. The attacks were extremely successful due to the expertise these raiders had in traveling over the snow.

During the westward expansion period, snowshoes were as essential as the axe and flintlock rifle in regions of heavy snow fall. Hunters, trappers, explorers and surveyors in these regions found snowshoes to be indispensible.

Both the Indians and white men of this period made snowshoes patterned after the ones made by Indians, developed in North America long before the white men arrived. However, these Indians did not simply dream up this idea in their heads. They had a little help from our animal friends - the snowshoe rabbit and the ruffed grouse. By observing how these creatures could so easily travel on top of the snow the Indians wanted to know why. Upon examing their feet, they found them to be very large and with a great deal of surface area. With this in mind, the Indians constructed the first snowshoes, a crude combination of wood and rawhide.

SNOWSHOE PRE-TRIP

These activities are designed to prepare the student for the actual snowshoe lesson. They include concepts that will insure the students' comprehension of certain ideas in the lesson, and will provide a strong foundation on which to base further learnings during the lesson. Pre-trip activities are essential in the Outdoor Education lesson in order to maximize the learnings that can take place.

I. SOCIAL STUDIES

A. Discuss the history and development of snowshoes in North America.
   1. Indians
   2. French voyageurs, mountain men and trappers

B. Discuss how snowshoes are and could be used in our everyday life.

C. List persons and occupations that may need snowshoes in winter.
   1. Discuss what each might have to do if snowshoes were unavailable.

D. Are there different kinds of snowshoes? Why?

II. LANGUAGE ARTS

A. Assign students to find stories, poems, photographs, magazine articles, etc., that mention or are about snowshoes.

B. Cut snow scenes from magazine articles and make up stories about them.

C. Make up words for the different kinds of snow, ie; fluffy, wet, hard, etc.

III. ART

A. Draw winter scenes; or make a winter outdoors collage using magazine cutouts.

IV. SCIENCE

A. Do the following experiment:
   1. Have one child hold a sheet of paper tightly between his hands.
   2. Have another child try to put a hole in the paper by applying
      a) pencil point
      b) pencil eraser
      c) finger
      d) thumb
      e) fist
      f) palm of hand.

SNOWSHOE PRE-TRIP - Cont'd.

3. Place object on paper and then apply pressure.
4. Relate the principles involved (pounds per square inch - PSI's) to snowshoes.

B. What is snow? Discuss snow, its properties and unique structure.

C. Does everything die in the winter? Discuss the changes that occur in the plant and animal world during our northern winters. (our hard woods require the winter dormancy period!)

V. MATH

A. Discuss the principle of pounds per square inch.

GOING UP

Two snowshoers moving out uphill make use of a rolling gait and step on their traverse.

GOING DOWN

Three styles of downhill technique: A, leaning slightly backwards; B, using cord to keep from becoming mired in deep snow; and C, the easy, if damp, way.

LESSON

This is the basic snowshoe lesson outline. It is designed for the beginning snowshoers, to acquaint them with snowshoes, and their evolution, construction, principles, types and uses. Basic motor sequences in snowshoe use are included. This learning about outdoor living skills and the proper use of the outdoors is essential in today's capsulized, automated society. (and is incidentally mandated by the New York State Education Department.)

The outline is divided into two parts. The first, to be done indoors just prior to going out, is an orientation to and discussion about snowshoes. The second part is the actual outdoor snowshoe lesson. The first part can be done inside or outside; however, to minimize cold kids, frozen feet and extraneous attention grabbers, and to maximize outdoor learning time and attention spans, we recommend starting indoors.

I. Orientation and history

A. What is a snowshoe?

B. Is a ski a snowshoe?

C. What is the difference?

1. A snowshoe is a means of adapting to the deep snows of a winter environment, enabling the wearer to walk on top of the snow rather than through it. Snowshoes have a frame made of wood, aluminum, fiberglass or plastic; and webbing laced around the frame, made of rawhide, leather, neoprene, saplings, bark, plastic or cordage. Bindings are made of leather, cordage or neoprene.

2. A ski is a form of snowshoe, although not usually considered as such. The principals behind each are the same; i.e.: enabling the wearer to travel on top of the snow.

3. The differences between each include:

a) shape

b) ski used to glide, requires wax

c) ski faster

d) snowshoe more maneuverable

e) snowshoe can carry more weight

D. Who invented snowshoes?

1. North American Woodland Indians refined a central Asian invention. (see history section)

E. Snowshoes originated in nature

1. Consider nature's snowshoes

LESSON (cont'd)

a) grouse
b) snowshoe rabbit
c) padded paws of fox and lynx

2. List animals with good snowshoes
3. List animals without good snowshoes

II. Principals behind snowshoe construction.

A. Discuss pre trip activity of pencil point vs palm of hand pressure on paper..

B. Imagine human feet as pencil point, and palm of hand as snowshoe.

1. Apply principal to walking on snow
2. Why do you sink in boots?
3. Why do you stay on top in snowshoes?

C. Snowshoes spread the weight evenly over a large surface area, so there are fewer pounds per square inch. (PSI's)

D. Purpose of part of snowshoe.

1. Webbing - hold above snow w/out gathering snow or ice weight.
2. Toe hole - enable toe to grip snow going uphill. (see chart)

III. Snowshoe types and uses.

A. Discuss briefly the different types of snowshoes and their uses. (see chart)

1. Why are some snowshoes good for certain activities and not for others?
2. Describe best uses for the following basic snowshoe types:

a) bearpaw
   1) thick brush, woods, light packing, whenever maneuverability is essential

b) Michigan or Maine
   1) woods paths, with heavy loads, when maneuverability, weight and ability go in straight line are all essential

c) pickerel or trail
   1) open country, trails, where speed is essential

IV. Care of snowshoes

A. Varnish rawhide and wood at least once a year.

B. Do not walk on pavement or other-than-snow surfaces.

C. Do not use shoes as a bridge, i.e. unsupported in middle.

LESSON (cont'd)

V. Putting them on!!

A. Demonstrate procedure of putting shoes on inside, both on blackboard and for real. (use someone's boot on a table for all to see) This is the most time-consuming aspect of the lesson. (be sure the children understand this process before going outside, or you will be the one getting frozen fingers undoing the kids' mess of bindings!)

VI. Go outside

A. Show them one more time how to put them on.

B. Then distribute snowshoes.

1. Check all bindings for proper adjustment and fit.

C. Let students walk around to get used to feel for about 5 minutes.

VII. Snowshoe use

A. Discuss and demonstrate proper gait.

1. Start off slowly, one foot in front of other, lifting a bit with knees and toes.

2. Emphasize naturalness: no waddle or awkward walk is necessary.

B. Uphills

1. Lean forward, digging toes in to grip snow.

2. Traverse if hill too steep.

C. Down hill

1. Lean backward, keep toes pointed up.

a) A string attached to the front tip of the snowshoes will help pull the toes up if the going is steep or if the snow is powdery and deep.

2. Put one foot in front of other, crouch with weight on back shoe, and slide!! (but watch those toes!)

a) A stick or ski poles may help as brakes when dug into snow.

D. Turning

1. First attempt to go backwards (its next to impossible!) This demonstrates necessity of turning.

2. Step turn

a) Keeping rear of snowshoes together and stationary, rotate in one direction, then other.

a) never cross or step on shoes

b) a handy turn to know for thick brush

LESSON (cont'd)

3. Kick turn
   a) Lift one shoe free of snow, keeping toe pointed, and place it 180^{o} from original direction, next to other shoe. Lift other foot out and follow through.
      1) This seems a bit awkward but is really very simple. It resembles the third position in ballet in midturn. Its very handy for crossing fences and the like.

E. Falls

Falls are inevitable, but usually not dangerous if snowshoer can get back on feet

1. To get up, draw feet into a normal side by side position.
2. Draw shoes beneath body, or get weight of body over shoes. This can be done easily by crossing skipoles, sticks, pack, etc. and placing hands on this support while performing above.
3. Get up!

VIII. Activities

After students are accustomed to snowshoes and have achieved a basic motor ability, activities can be done that will enhance this ability. Consult the games and activities section of this packet for in-depth consideration of these.

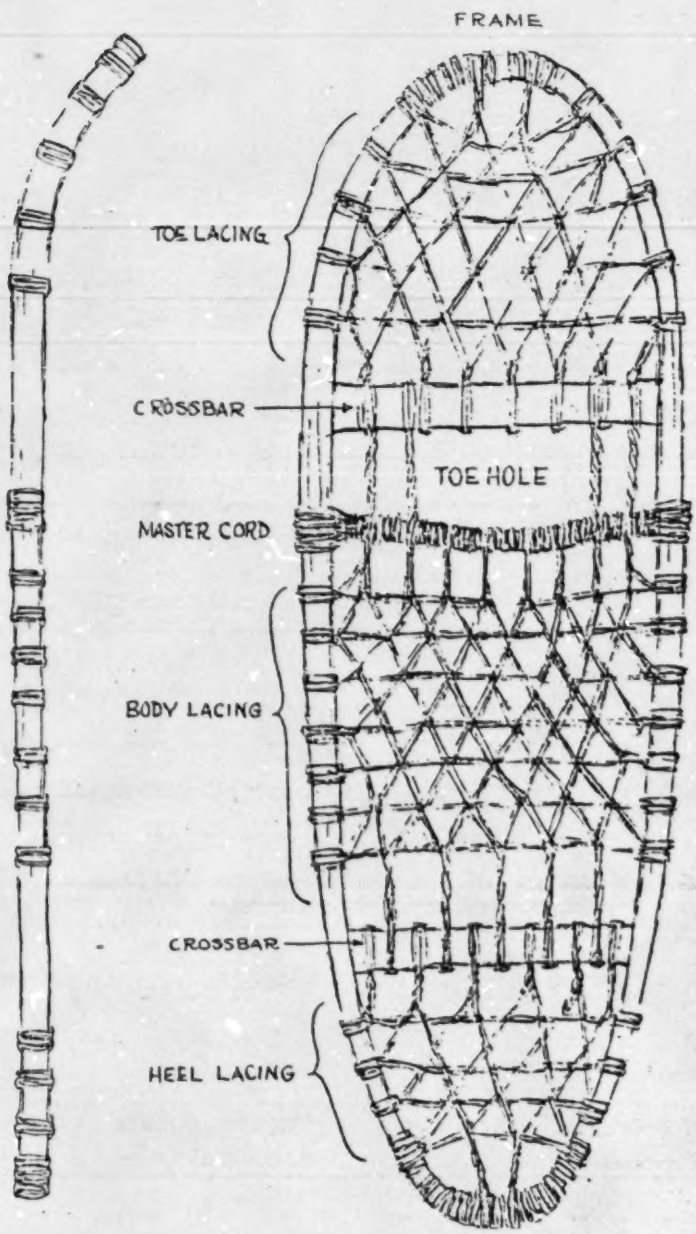
A. Walking
   1. Rabbits and foxes
   2. Obstacle course
   3. Hike

B. Running
   1. Races
   2. Relay races
   3. Hurdles
   4. Potato race
   5. Ring race
   6. Fox and goose
   7. 3 legged race

C. After the initial excitement of learning to snowshoe is over, you may wish to conduct winter Outdoor Education activities that use the snowshoes as a means to an end rather than an end in themselves. (see packet info.)
   1. Nature hike
   2. Animal tracks lesson

LESSON (cont'd)

3. Winter sensory experiences
4. Schedule a snowshoe hike at Owahta Outdoor Education Center
5. Winter survival



Green Mountain modified bearpaw, one of the most popular snowshoe models.

POST TRIP FOLLOW-UP

These suggested activities and ideas are designed to reinforce concepts learned outdoors during the lesson, and to provide an opportunity for individual and group initiative, keying on the experience. Ideas are also provided for further outdoor study on snowshoes, using this unique form of winter mobility to more fully explore the winter outdoors. This most neglected of seasons should be utilized to its fullest in the educational setting, and through the use of snowshoes this can be achieved.

I. SOCIAL STUDIES

A. Research Pioneer and Indian adaptations to winter life, of which the snowshoe was just a part.
   1. Make a diorama of a winter Indian village, or Pioneer home.

B. Discuss winter activities of the Pioneers. Stress the need to adapt, and how everything was keyed on the season.

C. Discuss again the possible everyday uses of snowshoes, and the occupations most likely to use them.

D. Research and trace the history of snowshoes and their development. Discuss all types, including skis.

E. Discuss how snowshoes helped in the exploration and settlement of North America.

F. Contrast historical uses of snowshoes with modern day uses.
   1. How are they different?
   2. How are they similar?

G. Discuss the impact of snowmobiles on the winter environment.
   1. Compare snowmobile impact with snowshoe or snow ski impacts.

II. LANGUAGE ARTS

A. Start a story and have the students use their imaginations to finish it, either on paper, or in a round verbally.
   1. Trapper in deep woods - suddenly a blizzard . . . . . .
   2. Walking on snowshoes in woods - suddenly break through surface into a hibernating bear's den . . . . . .
   3. Crossing the lake on the ice, and suddenly break through . . . . .
   4. Hurrying home on snowshoes, just before dark, when one snowshoe breaks . . . . .

POST TRIP FOLLOW-UP (cont'd)

B. Research, write and present a report, play, or story about how snowshoes developed.

C. Write poems about the snowshoe experience.

III. ART

A. Make your own snowshoes with native materials (directions included in packet).

B. Draw snowflakes.

C. Preserve snowflake patterns and shapes, using directions found in packet.

D. Invite a snowshoe craftsman in area to demonstrate his craft to the class.

IV. SCIENCE

A. Consider snow crystals, their structure and formation, and unique characteristics.

B. Melt some snow, and test its quality. Areas can include pH and certain chemical compounds. Testing kits are available from the BOCES Outdoor Ed Program.

C. Invite a local health technician to speak to your class on effects of air pollution in snowfall.

D. Discuss the function of winter as nature's way of culling the sick, old and weak plants and animals. Discuss the survival of the fittest, and man's possible intervention in this process.

E. Make a list of animals that have evolved their own snowshoes.

1. Consider how other animals have adapted for survival.

F. List and draw some different kinds of snowshoes.

1. Discuss why certain types are shaped as they are, and speculate as to the reasons why.

2. Match the best use/environment of each type of snowshoe with the different kinds.

G. Have students bring in snowshoes that belong to their family.

H. Discuss avalanches, their causes and effects.

I. Consider factors in winter survival.

1. Heat and warmth

2. Shelter

POST TRIP FOLLOW-UP (cont'd)

V. MATH

A. Measure the amount of snow it takes to make a unit of water.

1. Convert to metric equivalents.

B. Consider pounds per square inch.

1. Figure PSI's for various types of snowshoes.

VI. PHYSICAL ED

A. Utilize snowshoes to perform various physical activities.

1. Snowshoe olympics
2. Snowshoe orienteering
3. Snowshoe hike
4. Snowshoe winter survival
5. Snowshoe winter sensory
6. Snowshoe games

HOW BODY HEAT IS LOST

Man feels the "cold" when body heat is given off by any of these five physical processes:

1) Respiration: In a cold environment, the air we breath enters cold and leaves warm. This results in a significant amount of heat loss, plus energy loss in heating the air. Obviously we cannot stop breathing to prevent this heat loss. However, we can pre-warm the air we breathe by installing a wool scarf across the face.
2) Radiation is a major cause of heat loss. The body is like a large radiator, 70% full of hot water. It operates like a home radiator, and heats the body's micro environment.

   The head receives the most blood and oxygen and consequently the most heat. Doctors have stated that heat loss is so rapid from an unprotected head that 50% of the body's total heat production may be lost at $40^{o}F$, and up to 75% when the temperature is $5^{o}F$. Covering the head will conserve body heat and energy. Perhaps this is why the old mountaineers always say, "When your feet are cold, put on your hat."
3) Conduction heat loss results whenever the skin touches anything less than body temperature. In a controlled environment, such as a home (approximately $70^{o}F$), this heat loss is minor. But sweaty or rain-soaked clothing can extract heat at a fast rate. Experienced outdoorsmen watch not only the temperature of the air, but of the wet clothing touching the skin. In a cold, wet and windy outdoor environment, we normally use more muscle energy, often overproducing body heat. This can result in sweaty clothing, causing body heat loss.
4) Evaporation is the natural way the body cools itself. Whenever the body temperature is above normal the sweat glands will excrete water. This body water may be evaporated to the air, causing heat loss. The amount of evaporation of heat loss is determined by the relative humidity of the surrounding air.

   Sweat saturated clothing can cause rapid chilling of the skin. Clothing must breath to allow water vapors to pass. They must be removed in cold environments to prevent a combined conduction/evaporation heat loss. The only way to conserve energy to prevent wetting of clothing is not to sweat, or wear clothing designed to allow for perspiration, such as fish net underwear, or wool.

HOW BODY HEAT IS LOST (cont'd)

5) Convection of warm air away from the body is another major method of heat loss. The body continously warms the thin layer of air (micro environment) next to the skin by radiation. This micro environment is close to our body temperature and is regulated by the amount and type of clothing that we wear. Animals use fur to protect this vital layer. When participating in outdoor winter activities we must be constantly alert to protect the body's micro environment from heat loss.

WIND CHILL:

The body can withstand a greater degree of cold with the absence of wind. But with the increase of wind velocity, the heat loss and energy loss become more critical. The wind chill effect is a process of convection of warm air away from the body and replacing it with cold air.

WIND SPEED		COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE"																				
KNOTS	MPH	TEMPERATURE (°F)																				
CALM	CALM	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60
		EQUIVALENT CHILL TEMPERATURE																				
3-6	5	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-65	-70
7-10	10	30	20	15	10	5	0	-10	-15	-20	-25	-35	-40	-45	-50	-60	-65	-70	-75	-80	-90	-95
11-15	15	25	15	10	0	-5	-10	-20	-25	-30	-40	-45	-50	-60	-65	-70	-80	-85	-90	-100	-105	-110
16-19	20	20	10	5	0	-10	-15	-25	-30	-35	-45	-50	-60	-65	-75	-80	-85	-95	-100	-110	-115	-120
20-23	25	15	10	0	-5	-15	-20	-30	-35	-45	-50	-60	-65	-75	-80	-90	-95	-105	-110	-120	-125	-135
24-28	30	10	5	0	-10	-20	-25	-30	-40	-50	-55	-65	-70	-80	-85	-95	-100	-110	-115	-125	-130	-140
29-32	35	10	5	-5	-10	-20	-30	-35	-40	-50	-60	-65	-75	-80	-90	-100	-105	-115	-120	-130	-135	-145
33-36	40	10	0	-5	-15	-20	-30	-35	-45	-55	-60	-70	-75	-85	-95	-100	-110	-115	-125	-130	-140	-150
WINDS ABOVE 40 HAVE LITTLE ADDITIONAL EFFECT.		LITTLE DANGER					INCREASING DANGER (Flesh may freeze within 1 min.)						GREAT DANGER									
		DANGER OF FREEZING EXPOSED FLESH FOR PROPERLY CLOTHED PERSONS.																				

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HOW BODY HEAT IS LOST (cont'd)

HOW TO DRESS:

Clothing is basically worn to: 1) keep warm, 2) provide ventilation to carry off moisture, 3) keep dry and 4) be functional for hiking.

Insulation combined with body heat is the key to keeping warm in a cold environment. For the most part, insulation is determined by the combined thickness of all the garments worn. Cold, still air conditions need thick layers of dead air spaces. Many layers of clothing are desirable because of the trapped air spaces between them. In windy conditions, the size of the interspaces between the weave determines the amount of warm air transferred. Large knit sweaters are effective in still air, but allow for fast heat transfer under windy conditions. Outer clothing should be windproof.

Sweating can lead to freezing. When exerting, one can take off a layer or two of clothing to regulate the body temperature. When working stops, put the clothes back on to prevent chilling.

Clothing should be worn loosely. Tight fits tend to cut off circulation and increase danger of freezing. Wool clothing still remains the best all-purpose outdoor clothing. Wool conducts less heat than other materials when wet. Down materials provide an excellent insulation due to the trapped air spaces between layers, but only when dry. Fiberfill and polarguard are fast achieving popularity in this respect. These materials provide ventilation and breathing. Wool has the property of keeping the body warm even when it is wet.

Cotton fabric can provide an excellent layer system of dead air spaces for insulation in the cold. However, the danger with cotton fabric is that it absorbs and retains water. Saturated cotton can result in heat loss nearly 240 times faster than dry cotton clothing.

Heat loss will result in portions of the body that are left unprotected (i.e. the head, wrists, ankles, etc.). A special effort should be made to cover areas that are left exposed to the cold.

Clothing is simply a protective shelter that we carry around. The immediate effect of clothing is to trap a certain thickness of body-warmed air from escaping into heat loss. When the body comes into contact with cold ground, wet clothing, wind, etc., the transfer of heat will be rapid.

THINGS TO LOOK FOR IN OUTER WEATHER GARMENTS:

FIT: Loose- large enough to add clothing underneath. Easy off, easy on. Freedom of movement for arms, legs and shoulders.

WORKMANSHIP: Hood permanently attached. Pockets covered. Type of zipper and buttons - you will be trying to use these with cold fingers.

THINGS TO LOOK FOR IN OUTER WEATHER GARMENTS:

FABRIC: Weave, density and loft. Water absorbency or repellency of fibers. Drying and matting problems. Strength and quality. Insulation value of filler material.

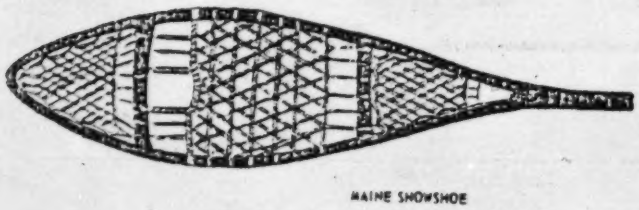
VENTILATION: Be sure you can open and close ventilation openings easily. This is very important to help control your body's micro-environment.

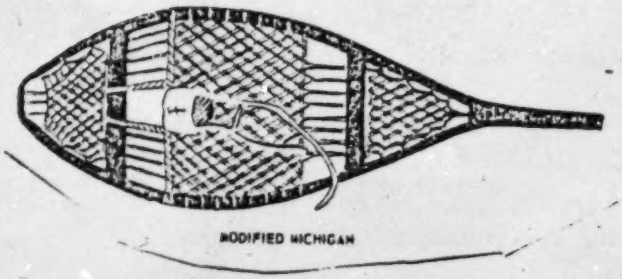
TYPES AND USES OF SNOWSHOES

Snowshoes come in many shapes. Over the years there have evolved hundreds of models but the three basic ones are: 1) The Bear Paw, 2) The Maine or Michigan and, 3) The Pickerel Snowshoe.

The oval shaped bear paw is the most universally known model. Its wide base covers more area and is best used in heavily wooded country where many tight turns are necessary. There are many variations of the standard bear paw. One is called the Green Mountain Modified bear paw, and another, the Westover Style bear paw. These are improvements because they are skinnier and are less inclined to tilt downslope when traversing a hillside.

For long trails and semi-open areas the Michigan or Maine models are the best. They are tear drop in shape, have long narrow tails and a broad slightly upturned nose. They are tail heavy, which keeps them on course but is also helpful in bringing the tips up out of the snow. In the northeast one will usually find this type of snowshoe.





TYPES AND USES OF SNOWSHOES (cont'd)

For deep snow the Alaskan or Pickerel snowshoe is best. The upward bend at the toe makes this model a favorite for deep snow travel. The tips will not catch in deep snow and this is the main advantage of the Alaskan snowshoe. For open cross country excursions on deep snow this snowshoe is unsurpassed. However, in heavily wooded areas this snowshoe is a disadvantage, because short turns and maneuverability is sacrificed for speed on the open trail.

Another type of snowshoe style is the Ojibwa. This style is very similar to the Alaskan and it too is best for deep snow and open areas. The tip of the Ojibwa is pointed and upturned, hence the tip knifes through deep snow and does not load up with snow. The tip also need not be steamed into shape but can be joined by lashing. This type is the easiest to make in emergency situations. (See section on "How To Make Snowshoes.")

CARE AND MAINTENANCE

Throughout time men and women have trekked across many a snow covered terrain in their trustworthy snowshoes leaving behind them countless numbers of saved hours and energy, and an array of varying snowshoe prints. It would be a shame in some cases and dangerous in others to not show some respect for the foot trodden snowshoe, and the best way to do that is to take care of the snowshoes. Wooden framed snowshoes require a great deal of care and maintenance, and wood frame snowshoes with rawhide lacing require even more care. These rawhide lacings should be given a coat of waterproof spar varnish or polyurethane varnish whenever the finish gets worn. Synthetic (nylon/neoprene) lacing does not require varnish, but still the frames deserve a good layer of varnish from time to time. When not in use snowshoes, like apples, should be stored in a cool, dry place and hung out of reach of gnawing animals. This is particularly true in the case of snowshoes laced with rawhide. Gnawing rodents love rawhide webbing.

Remember, take care of your snowshoes and your snowshoes will take good care of you.

SOMETHING OUT OF NOTHING

If you've ever made something yourself you know the feelings of pride and sense of achievement you experienced. A real test of your resourcefulness is to make snowshoes out of saplings carefully notched and lashed together.

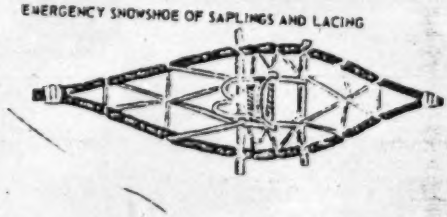
But first it is a good idea to have an adequate repair kit, which includes; 1) wire, strong but pliable; 2) rawhide lacings or nylon; 3) a jackknife; 4) a fishline or 1/8" nylon cord about 100 feet long; 5) a pair of lightweight pliers; 6) a roll of adhesive tape or duct tape; and 7) a single edge razor blade.

Over the years snowshoes have been made from: branched saplings; folding alluminum chairs; plastic tubing and packframes. For do-it-yourselfers, articles printed in Field and Stream, one entitled "Snowshoes of Plastic" January '74, p18-19 and "Emergency Snowshoes" November '73, p36, are both in-depth articles on how to make snowshoes. But here we will explain how to make snowshoes out of branched saplings.

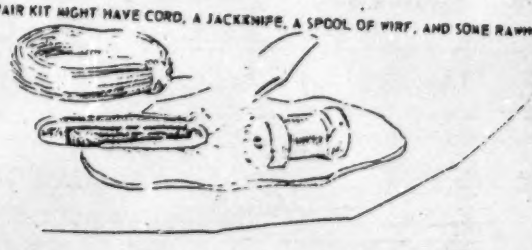
An open country snowshoe, one that is easiest to make, can be constructed using branched saplings cut just below the crotch. The two branches are then lashed together at the other end so that a long tear-drop is formed. The crotch end of the branched sapling is the front of the snowshoe and the lashed end is the rear. Next, two heavier cross sticks are placed about 1/3 of the way from the tip, mark the frame where the sticks touched it and cut notches at these places. Then place the cross sticks in position and lash them tightly in place. Make sure there is enough room for the tip of the foot to fit through the two cross sticks, this is important. Smaller sticks are then lashed across the two larger cross sticks. This allows an open space for the toe of the foot to move through. The frame is now completed.

Different types of webbing can be used across the frame to form a grid pattern. Criss-crossing from side to side, bass wood bark; smaller saplings or tape (whatever is strongest and most convenient) can be tightly stretched across the frame to provide more surface area. Remember, the tighter the webbing is on the frame the better its ability to hold you up in the snow.

EMERGENCY SNOWSHOE OF SAPLINGS AND LACING



EMERGENCY REPAIR KIT MIGHT HAVE CORD, A JACKKNIFE, A SPOOL OF WIRE, AND SOME RAWHIDE



ACTIVITIES FOR SNOWSHOEING

1) Rabbits and Foxs: Have the group count off by ones and twos. The ones are rabbits and the twos are foxes. This activity is most effective with a new fallen snow or an area not trackeddown. Each rabbit takes off, each on his own trail with the object of confusing his fox. After a 3 minute headstart a fox follows the trail, with instructions not to break new trail. The goal is to catch the rabbit. This can be started in an open field and then moved to a wooded section for more of a challenge

2) A wide variety of races offer good practice in snowshoe maneuverability. A race is also a good way to bring a lesson to a close and head the students back to the school building quickly and willingly;

Relay races

Walking races

Running races

Obstacle course

Climbing races (racing to the Top-of-the-Hill)

Descending races

3 legged races (2 students, 3 snowshoes and both middle legs are tied together.)

3) Drawings Or Writing In The Snow: A good way to stimulate language arts as well as group cohesiveness is to get one group to draw or write a message in the snow and the other group to do the same. When each group is done each tries to decipher the message.

4) Shadows: (This activity calls for a sunny day) Before starting out on a hike have everyone line up single file. Then one person outlines the shadow of the person in front making sure they know exactly where they were standing. Later on, come back and have those same people stand in their original tracks. This exercise should demostrate the earths rotation and is especially interesting if the teacher asks these questions: Did the sun move? Did the earth move? How fast?

ACTIVITIES (cont'd)

5. Outdoor Measurement Activities: Again this activity calls for a sunny day. To find the height of a tree, hold a stick of known length (yardstick, meter stick) perpendicular to the ground and measure the length of its shadow.

Measure the shadow cast by the object to be measured. Then solve this proportion:

$$\frac{\text{shadow of object}}{\text{shadow of stick}} = \frac{\text{object's height}}{\text{sticks height}}$$

example: 3 ft. yard stick casts
2 ft. shadow. Tree casts 10 ft. shadow.

$$\frac{10}{2} = \frac{\text{tree's height}}{3}$$

Tree's height = 15 ft.

Another measurement is to determine the depth of the snow to actual inches of precipitation. Collect snow in a metal bucket and melt. The amount of water will be considerably less than the volume of snow. Have the class estimate how many inches of snow makes an inch of rain. Pour the water in a glass and observe the turbidity.

6. Tracks In The Snow: Nearly all children are extremely interested in animals. Hence, little is needed in the way of motivating children to study birds, insects, etc.

Have the group follow a set of tracks noting:

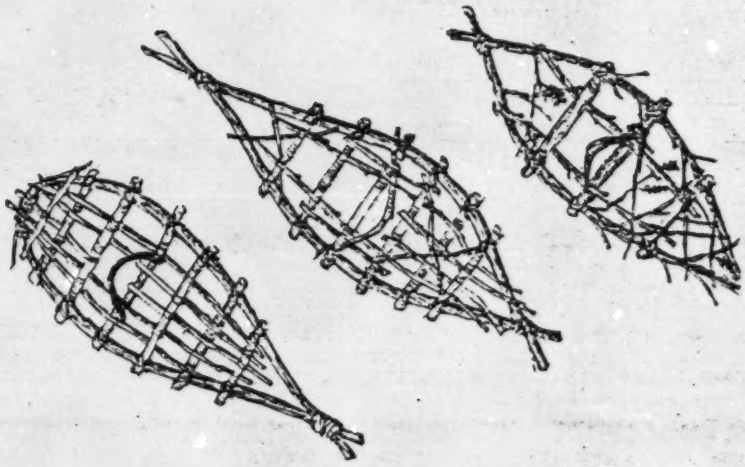
- What direction was the animal going?
- How wide is the track?
- What is it?
- Is the track fresh or old?
- Was the animal running or walking?
- What are the feet adapted for?
- What kind of food would this animal eat?
- Where does it live?

ACTIVITIES (cont'd)

Care should be taken so that none of the tracks are damaged. Questions like the above may be used to stimulate interest and curiosity.

For a guide to animal tracks check out the Winter Outdoor Education Activities booklet prepared by Cortland/Madison BOCES Outdoor Ed. Program or Olaus Murie's A Field Guide To Animal Tracks.

REPAIRS IN THE FIELD



Improvised snowshoes using branches, twigs, and makeshift webbing material — good examples of what can be done in an emergency.

PRESERVING THE TRACKS

Equipment needed (group of 8 or 10):

3 tin cans (#10 size) with plastic tops.

Construction paper, strips of file folders, etc., cut up strips about 1½ inches wide to make collars.

10 paper clips.

Procedure:

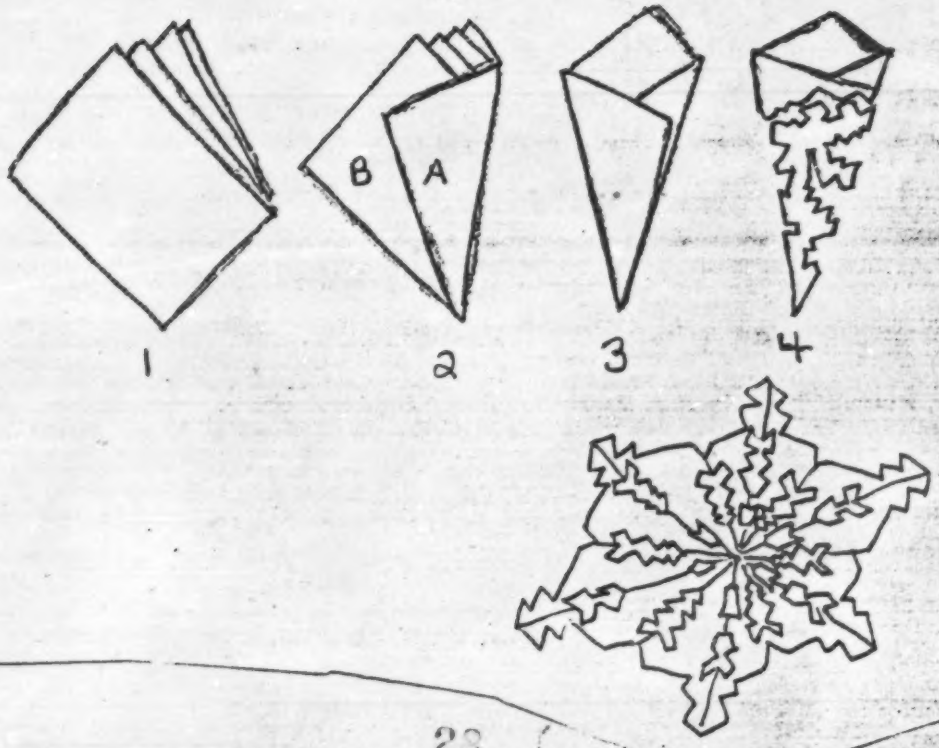
1. First select a track and spray a fine layer of water over the track. (A windex bottle works great) It must be a cold day otherwise the spray will not freeze and harden the track. Position a strip of construction paper around it making sure the collar is tight to the ground so no plaster will seep out.
2. Pour plaster (#10 can holds plaster for about 10 tracks) into mixing can, then add water and stir til it reaches the consistency of pancake mix. (ratio - 2 parts plaster to one part water.)
3. Quickly mix and pour into tracks (plaster will set in a few short minutes).
4. Before completely hard shape a paper clip to serve as a hanging hook and secure into back of plaster.
5. After hardened (1-3 hours), remove collar slowly. (Don't litter!)
6. Clean the cast with a paper clip or old brush and mount.

PAPER SNOWFLAKES

Paper snowflakes can easily be made by using small, white paper napkins that are folded in quarters. Or, using construction paper, fold in quarters (1) next, fold a corner on the right (A) to the left (B) so that a triangle is formed. Then fold (B) over (A) so that you get a shape like that in 3.

Start cutting the top of the napkin in a jagged line so that the entire top is cut off. Continue to make cutout designs on the sides but make sure the napkin isn't cut in half. Open the paper and behold your own snowflake. It's a great Christmas gift or decoration.

This exercise is a good science and art experience for the student. Explain snowflakes, crystals, precipitation as well as geometric designs to the students - but mostly let them participate. Ask the class to observe real snowflakes! Are all snowflakes six-sided?



HOW TO MAKE PERMANENT REPLICAS OF SNOWFLAKES AND OTHER FROZEN CRYSTAL STRUCTURES

Some of the most fascinating geometric designs to be found in nature occur when moisture in the atmosphere condenses to form ice crystals. These crystals or snowflakes take many different forms. If one observes carefully the flakes that fall on a dark coat or jacket (or preferably a piece of black velvet, flannel, or even black cardboard), one can usually identify all of the general forms during a winter and sometimes even during one storm. But the interesting thing is that there is a method available for making replicas of these snowflakes which allows them to be preserved indefinitely.

The method, developed by Dr. Vincent J. Schaefer, makes use of a special solution consisting of a powdered plastic resin, polyvinyl formal (Formvar 15–95)*, dissolved in ethylene dichloride to make a 1% solution by weight. All the photos shown are of snowflakes preserved by this technique.

The one method of making snow crystal replicas is as follows:

MATERIALS REQUIRED:

A small wide-mouthed glass jar or plastic container in which there is a 1% solution of Formvar 15–95 dissolved in ethylene dichloride, a clamp or gloves, glass microscope slides.

PROCEDURE:

1 Cool the container, and the 1% solution of Formvar to −5°C. (23°F.) and take to a protected location out of doors where free falling snow is available.

2 With the clamp or gloved hand, dip a cold 1" x 3" microscope slide into the solution, or apply a few drops from a plastic squeeze bottle. (If the slide is held in an ungloved hand, there will be danger that moisture from the hand will deposit on the cold slide and produce a layer of frost.)

3 Withdraw the slide. Hold it face up in the falling snow for 1 to 10 seconds depending on the intensity of the snow fall.

4 The crystals fall into the liquid and are immediately covered with a layer of replica solution. The liquid tends to creep over all of the crystal, even the parts projecting above the surface.

5 Place the sample in a well-ventilated but protected spot until all the solvent has evaporated. The longer the sample is kept cold, the better. The best replicas, especially of large intricately structured crystals, result if the ice is permitted to evaporate by sublimation (directly from ice to water vapor rather than through the liquid stage). If allowed to melt, the surface forces of the liquid water may cause the collapse of some of the finer detail of the replica.

6 If a larger sample is wanted, glass slides 2" x 2" or 3¼" x 4" may be obtained in a photo supply store. Even pieces of window pane may be used. To coat these slides, a polyethylene squeeze bottle may be used to spread the cold solution.

When a snowfall is sampled in this manner, the observer is generally dismayed by the fact that very few perfect crystals are found on the slide. This is due to at least two major factors:

1 Most of the snow in the majority of the snowstorms is made up of particles with irregular, broken or unattractive shapes.

2 Many symmetrical stellar (star-like) crystals often clump together as snowflakes, or coat with cloud droplets, or damage during aerial collisions especially in turbulent winds.

If the observer wishes to single out only perfect crystals, the following procedure will provide a fine collection:

MATERIALS REQUIRED:

A 1-foot square sheet of corrugated cardboard, a piece of black velvet, a sharp pointed rod (wooden toothpicks will do), a whisk broom, a small glass jar or plastic container of the replica solution having a temperature of −5°C. (23°F.), a microscope slide or piece of black cardboard.

PROCEDURE:

1 Stretch the black velvet over the corrugated cardboard.

2 Place the solution in a protected spot with the cover removed.

3 Lower the pointed rod several inches into the solution.

4 Quickly withdraw rod so drop of replica solution drains to its point.

5 Touch the surface of a cold microscope slide or a piece of black cardboard with the drop.

The drop will remain on the slide or cardboard several minutes before evaporating.

6 Expose the sheet of black velvet to the falling snow for a few seconds.

7 Quickly scan the resulting sample of snow for a satisfactory crystal. If one does not appear, brush the velvet with a whisk broom. Expose again.

8 When a suitable crystal is located, touch the still moist pointed rod to the crystal. It will adhere.

9 Quickly touch the adhered crystal to the drop of liquid on the slide. The crystal will sink into it.

This process may be continued until a satisfactory number of crystals have been obtained. If it is desired to make replicas of hailstones, a 2% solution of the replicating material will be required.

REPLICATION BY PLASTIC SPRAY

A very convenient and reasonably satisfactory method of replication can be achieved by using an aerosol plastic spray. A suitable type of dispenser with solution consisting of clear lacquer or similar material can usually be obtainable from a paint or an artistry supply store. The advantage of this method is the almost instant drying and the availability. Because the spray is finely divided and entrains much cold, it has been found possible to use the spray can without cooling it. It is important however, that under these conditions the spray be applied sparingly so that at no time does a wet layer of spray residue appear. The aerosol plastic spray works well in replicating window pane frost, three-dimensional layers of frost, or snow deposits.

Compiled by Raymond Falconer, Meteorological Analyst, ASRC

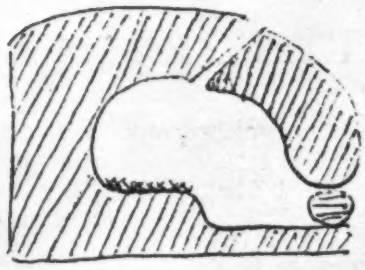
*Monsanto Plastics Div., 812 Monsanto Ave., Springfield, Mass.

SNOW BUILDINGS

An excellent way to stimulate interest is to have the group build a snowcave or igloo. Heap the snow in a mound slightly larger than the enclosure desired. Then have the class pack down the surface.

Then burrow into the pile at right angles to the wind; scooping out snow until a small cave is formed. If the weather is well below freezing and if water is at hand, spray some over the pile so that a glaze of ice forms on the top. Otherwise, let the mound harden in the cold air for a half-hour or so. Poke a hole through the top with a broomstick for ventilation. A very small fire within such a shelter will ice over inside, forming a strong, safe shelter.

This is an excellent time to discuss animal shelters, the science of staying alive, and house construction, as well as Eskimo life.



BIRDS OF WINTER

Now, with everyone donning their snowshoes and ready for an invigorating, exhilirating excursion into the wintery wonderland, here is a listing of some of the avian creatures who are wintering in our area:

OVER-WINTERING BIRDS

A. Indigenous

1. Black-capped Chickadee
2. White Breasted Nuthatch
3. Downy Woodpecker
4. Swamp Sparrow
5. Song Sparrow
6. Field Sparrow
7. Cardinal
8. Blue Jay
9. Tufted Titmouse
10. Goldfinch

B. Non-Indigenous

1. Slate-colored Juneo
2. Fox Sparrow
3. White-throated Sparrow
4. Purple Finch
5. Red Poll
6. Pine Grosbeak
7. Evening Grosbeak

CATEGORIES OF WINTER FEEDERS AND THEIR FOODS:

A. Insect Eaters

1. Woodpeckers
2. Creepers
3. Warblers

B. Seed Eaters

1. Sparrows
2. Juneos

C. Combination Eaters

1. Jay
2. Chickadees
3. Nuthatches
4. Titmice

Over-wintering Birds of Prey: In the bird kingdom there is nothing quite as beautiful than seeing the majestic, large soaring birds. Birds of prey are especially evident during the winter months. They are usually seen along field margins, atop trees and on telephone wiring or sailing overhead almost effortlessly.

BIRDS OF WINTER (cont'd)

A. Hawks - Typically dive on their prey, have round robust bodies, broad, rounded wings and a broad fanned tail.

1. Rough legged Hawk - Identified by a black belly, a broad black band on a white tail, black at the bend of the wing.
2. Red-tailed Hawk - Has a broad black band on the belly, the tail is reddish above and a light pink below.
3. Red-shouldered Hawk - Identified by reddish shoulder patches, tan under parts and narrow white bands on a dark tail

B. Falcons - are faster, more direct and have a more choppy flight. Their wings are long, pointed and tails are narrow at the tip.

1. Sparrow Hawk - Will hover when hunting. Identified by black "whiskers" on each side of the bill and banded rufous tail in flight.

C. Owls - are seen mainly at dawn or dusk, bing predominantly nocturnal hunters. They are large-headed, and short-necked.

1. Screech Owl - Only small owl with ear tufts. There are two phases 1) Gray phase: small, gray eared 2) Red phase: only rufous (red) owl with "ears".
2. Snowy Owl - A larger sized owl, lacks ear tufts. Has nearly all white plumage (young may be darker).
3. Great Horned Owl - The only large owl with ear tufts. Large ear tufts and white throat.

D. Partridges and Pheasant - These chicken like birds roam the underbrush.

1. Ring necked pheasant has a long, sweeping pointed tail. The male has a white neck-ring; the female is mottled brown.
2. Ruffed Grouse - A large, red brown or gray brown bird the usually springs in air with a startling whir.

BIRDS OF WINTER (cont'd)

BIRD IDENTIFICATION BOOKS:

"Birds of North America" Zim (Golden Nature Guides) best pictorally, expecially for the beginner.

"A Field Guide to the Birds" Roger Tory Peterson (Peterson Field Guide), more advanced bird watchers use this as their bible.

TEACHER TIPS

The snowshoe lesson in the winter environment can be a tremendously dynamic learning experience. However, the severity of the weather and other environmental factors will present very real problems which must be overcome in order to insure that learning can take place. It is with this thought in mind that this teacher tips section is being composed.

The first concern in winter outdoor education is dress. It is essential that students dress properly for outdoor learning. It is up to you, the teacher, to be sure that the students bring and wear proper clothing. They will not know what to wear and often parents are ignorant in this area also. A sheet on proper dress for the winter outdoors has been provided for your use in this packet. This in itself could provide a valuable learning experience for your class. At any rate proper dress is the first step in insuring a good winter outdoor education lesson. Cold children will learn little and retain less.

How long should you spend outdoors? If the children are dressed properly and physically involved in snowshoeing, an hour will be plenty. If they are passively listening, even 30 minutes might be too long when conditions are bitter. Watch for the signs of cold.

The first few times out, it will take a while to have the students put on the shoes. This is why we recommend starting indoors. Plan to spend at least 10 minutes trying to straighten out loose bindings and buckles the first time out. We have no cure for this - only experience.

Bindings often will be too large for small children. A leather punch to make new holes in the bindings will prove invaluable.

The first few times out, the students will be keying on the snowshoes as an end in itself. Let them run, more cognitive learnings can take place later. Once the students become used to the snowshoes, the shoes can be used as a means to experience the winter outdoors. The students must be allowed to experience the snowshoes first, however. Then they can be used as a springboard for further learnings.

Plastic snowshoes are virtually unbreakable. Students, however, should be taught the proper use and care of snowshoes as if they were the most fragile wood and rawhide shoes made. (Please consult care and maintenance section of this packet.)

As always, we have tried to cover as wide a range in ages as possible with this packet. As such, it is hoped that teachers will adapt the various aspects of this packet to the specific needs of their students.

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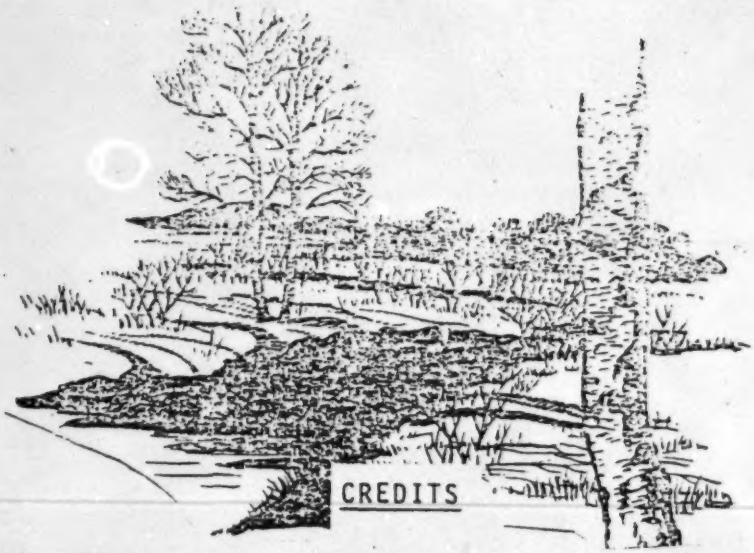

CREDITS

The North American Indian, whose feeling for the earth is epitomized by the moccasin and snowshoe, developed to "Tread Softly On My Mother's Bosom". . . . . .

Dave and George for Research and Development
Barb Tally for Artwork
Barb Brady for Typing
Cortland/Madison BOCES for making it possible

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